ODP #D-195

14 February 1980

MEMORANDUM FOR THE RECORD

SUBJECT: An Overview of Computer Applications in the
           Office of Economic Research (OER)

Introduction

1.   Analysts now use computers routinely to produce finished
economic intelligence.   Intelligence assessments, articles in the
President's Daily Brief, and other reports -- totaling 300 to 400
each year -- are based on support provided by the Office of Data
Processing (ODP).   These computer-based items include many of the
Agency's most important analyses, such as estimates of the
economic consequences of shortfalls in Iranian oil exports.   As
well, computers are being used to develop the next generation of
intelligence products, such as forthcoming studies of oil
productive potentials in certain key areas.

2.   Computers play two roles in OER.   The first of these
roles, which is the most traditional and the best-understood, is
that of helping analysts to store and retrieve information.   OER
maintains one of the world's largest libraries of economic
statistics, stored mostly on magnetic tapes and disks.   Hard-copy
versions of the half-billion numbers in the OER library would
more than fill the Agency's entire library space at
Headquarters.   Even so, the space-saving aspect of computer
applications is less important than the speed with which
computers can search through the data.   A single number in the
OER data library usually has at least six characteristics, all
machine-readable -- so efforts to search the data according to
the characteristics can be quite complex and time-consuming.
This feature of the library distinguishes it from many other
computer-based information systems such as the SAFE project, in
which thousands of records of words and numbers may be indexed by
only a few characteristics.

3.   Apart from the data storage/retrieval role, computers
are also used to convert raw intelligence into finished
intelligence.

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But the Agency's customers clearly want more than current
intelligence.

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To translate
current intelligence items into analytical reports, analysts need
to estimate relations among economic variables. These relations
are often quite intricate. In particular, the demand for energy
is a function of the price of energy and other factors. However,
the price of energy depends on the demand for energy. From
another perspective, the price of energy depends partly on the
price of oil, as a matter of accounting. These relations and
thousands of others are relevant in assessing the economic
impacts of OPEC decisions regarding oil production. In the
process of specifying connections among variables and using the
connections to make intelligence estimates, computers are often
absolutely essential. Hundreds of years and analysts would be
necessary to solve manually the simultaneous system of about 2000
linear and nonlinear equations that OER analysts use to gauge the
effects of various economic policy decisions.

4.   The only way to do without computers in making certain
economic estimates is to assume away part of the estimative
problems. Anyone can predict Soviet oil production by
extrapolating a trend line. This approach is cheap, quick, and
not dependent on computer support; but it is also not very
convincing. In attempting to do a thorough job of linking
together the various items of current intelligence that relate to
Soviet oil productive prospects, OER analysts find themselves in
the business of solving large systems of differential
equations. This is exactly what the Agency's customers want.
Some time ago, Senator Stevenson took pains to encourage the
Agency to devote more analytical horsepower to the question of
Soviet oil production, and his concerns have since been echoed by
dozens of other consumers of finished intelligence.
Consequently, the use of computers in interpreting current
intelligence is a growth industry.

The Management of Computer Applications in OER

5.   Managerial decisions regarding computer applications in
OER are guided by two main principles, both of which are fairly
unconventional. The first principle concerns the role of
computer technology in producing economic intelligence. At any
one time, OER uses a fixed configuration of computer hardware and
software. The analysts who work with these computer resources
cannot be expected to work more than 10 to 12 hours per day.
This means that more computer-related studies will require more
analysts to work with computers, at least over the next month or
two. However, the idea of increasing production by adding
analysts is generally a poor strategy over the long run. The big
gains in productivity have always resulted from advances in
computer technology, and not from adding labor to a fixed
technology. Thus OER spends the annual equivalent of two to four
man-years in finding and evaluating new computer systems for

producing economic intelligence, in cooperation with the Office of Data Processing (ODP) and the Office of Research and Development (ORD). This program of technology assessment is the single most important factor in OER's effort to use both computers and personnel efficiently.

6. The next most important idea in OER's management of computer resources is a principle of decentralized control. If a branch of OER can use a computer specialist full-time, then the branch is encouraged to hire the specialist or train an analyst. When a branch needs help in a computer-related area but cannot profitably keep a specialist busy full-time, then the branch asks the OER Development and Analysis Center (DAC) for help. By the same token, the DAC draws on ODP and ORD for specialized resources.

7. This decentralized system offers several advantages over a traditional organization in which all computer applications are done by one group. OER branch chiefs like the decentralized arrangement, because they usually do not have to deal with layers of bureaucracy in order to complete computer-related intelligence studies. At the same time, the system insures a careful use of computing resources. Job slots and desk spaces are perhaps the dearest resources for a branch chief, so a managerial system that encourages branch chiefs to use their own resources is likely to be less wasteful than a system in which a centralized bureaucracy grows above and beyond the control of the first-line supervisors of intelligence production.

8. A comparison among computer applications by different OER components indicates the distribution of control over computing resources. The DAC, which is the central computer group in OER, uses a little more than a third of the computing resources in the office, as measured by the user charges reported by ODP. From FY78 through FY79, the DAC's use of computers dropped as some developmental projects were completed and turned over to line divisions. At the same time, the line divisions expanded their use of computers (see Figures 1 through 4).

Research Problems

9. Despite the advances in computer technology over the last 30 years, many simple tasks still require incredibly complex computer programs. In particular, a month or so ago an analyst asked the DAC for help in estimating Iranian trade flows. The analyst's request was a simple, one-page shopping list. To meet the request, DAC analysts had to write more than 35 pages of complicated, cryptic computer codes (compare Figures 5 and 6).

10. To reach a better concordance between English-language requests and computer codes, OER looks forward to testing a new

data storage and retrieval system developed under a contract written by ORD. At the same time, DAC analysts are preparing a new version of the OER data library, based on another new language.

11. Apart from the challenge of providing easy access to data, there are several difficulties in using computers to interpret raw intelligence. OER's main problem in this area stems from the fact that thousands of equations are necessary to keep track of even the most basic international repercussions of oil price hikes and other influences on economic activity. An effort to take these relations into account is now stymied, because OER's econometric system cannot handle more than 2000 equations. To relax this constraint, OER will be working with ODP and with external research contractors.

Summary

12. Despite the technical challenges that remain to be met, the use of computers in producing intelligence is going well. Progress over the last decade has been tremendous, and the likely developments over the next few years will be even more impressive. ODP and ORD deserve much of the credit.

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Attachments:
Figures 1-6

-4-

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Figure 5

An Analyst's English-Language Request for Data

Categories of Iranian Imports

Food
  Live Animals
  Wheat
  Rice
  Corn
  Feedgrain

Oil Seed, Oil Nuts and Oil Kernals
  Soybeans

Oils and Fats -- Animal and Vegetable
  Soybean Oil

Fuels
  Coal Coke

Chemicals
  Fertilizer
  Pesticides

Iron and Steel Bars, Rods and Shapes

Iron and Steel Sheets and Plates

Machinery
  Farm Machinery
  Drilling Machinery
  Drilling Parts
  Air Conditioning and Parts

Transportation
  Trucks, Buses and Semi-Trailers
  Parts
  Airplanes

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